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Ethanol in gasoline: an immediate solution for renewables in road transport, the potential of E10 deployment in the EU

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About ePURE

ePURE
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ePURE: Voice of the EU ethanol industry

- 43 members, including 20 producing companies
- 50 plants across the EU and UK
- 85% of EU renewable ethanol production

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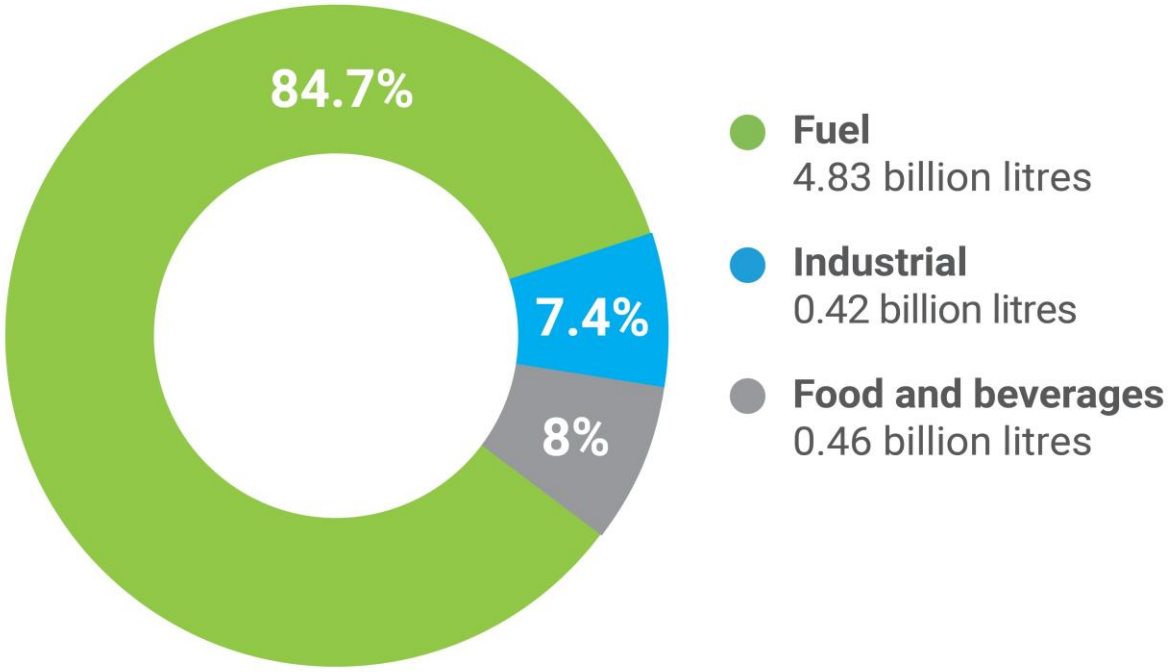
ePURE ethanol: More than just fuel

Renewable ethanol production by end-use



In 2022, ePURE members produced 5.71 billion litres of ethanol, operating at 79.8% of their 7.16 billion litres of installed capacity

Source: Aggregated and audited data of ePURE members for 2021 (pure alcohol)

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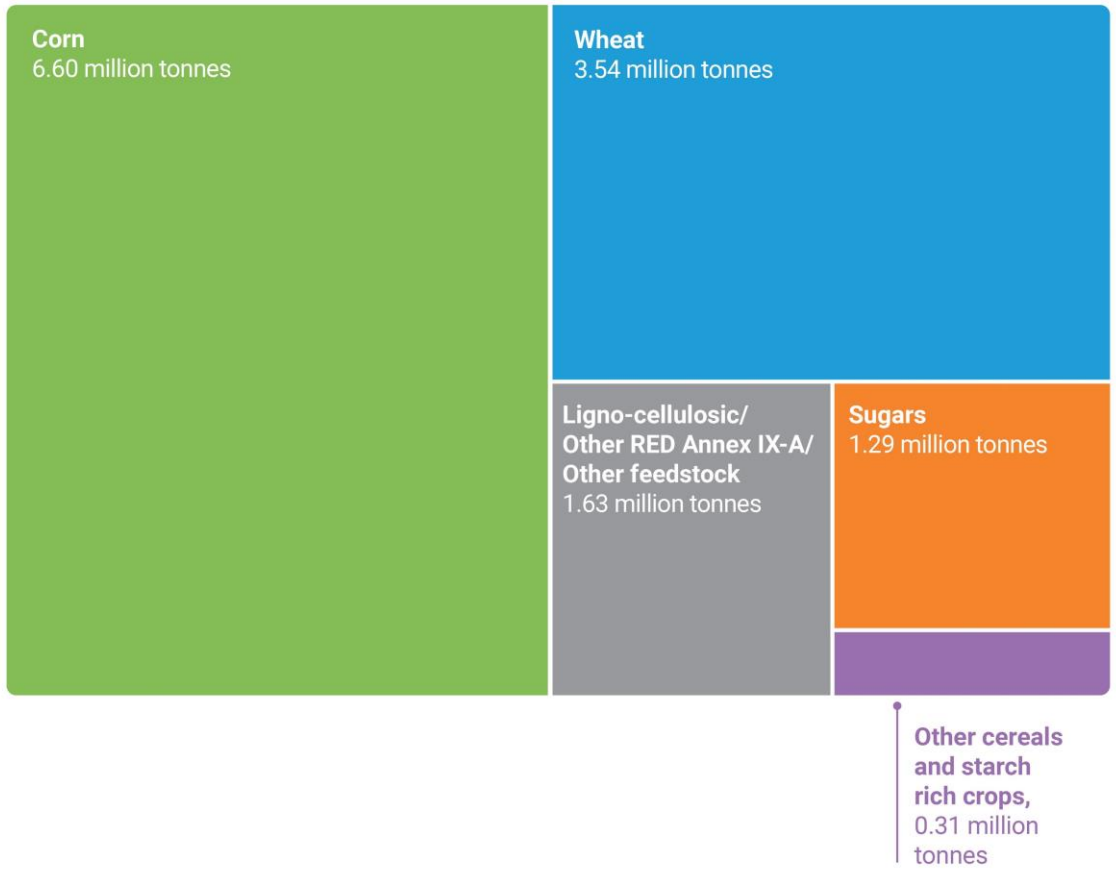
ePURE ethanol: Made in/from Europe

Feedstock used to produce renewable ethanol



- **All the feedstock used to produce renewable ethanol by ePURE members was grown in Europe**
- Of the 5.71 billion litres of bioethanol produced in 2022
  - 47.8% was from corn,
  - 22.3% was from wheat,
  - 13.9% was from sugars,
  - 1.9% from other cereals and starch-rich crops, and
  - 14.1% from ligno-cellulosic, other RED Annex IX-A, and other feedstocks.

Source: Aggregated and audited data of ePURE members for 2022. Sugars – sugar equivalent; Ligno-cellulosic/Other RED Annex IX-A/Others – dry matter equivalent

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ePURE production circularity: More than just ethanol

Main output of European renewable ethanol plants

In 2022, ePURE members produced more food and animal feed than ethanol

Source: Aggregated and audited data of ePURE members for 2022
Ethanol – pure alcohol; Food and feed co-products – commercial product equivalent; other co-products – commercial equivalent

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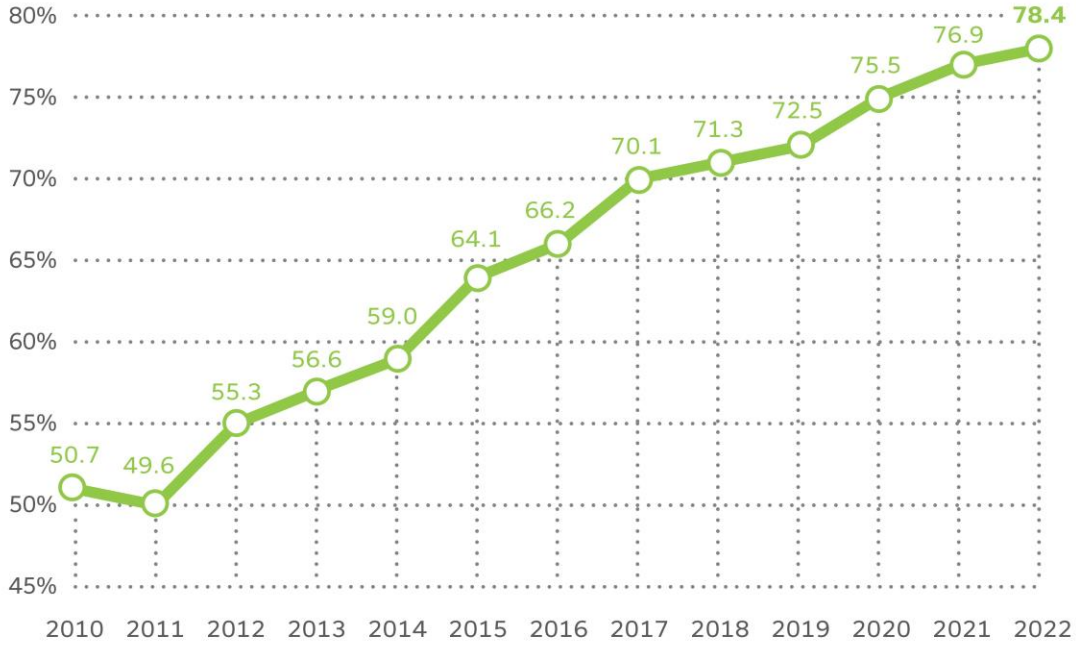
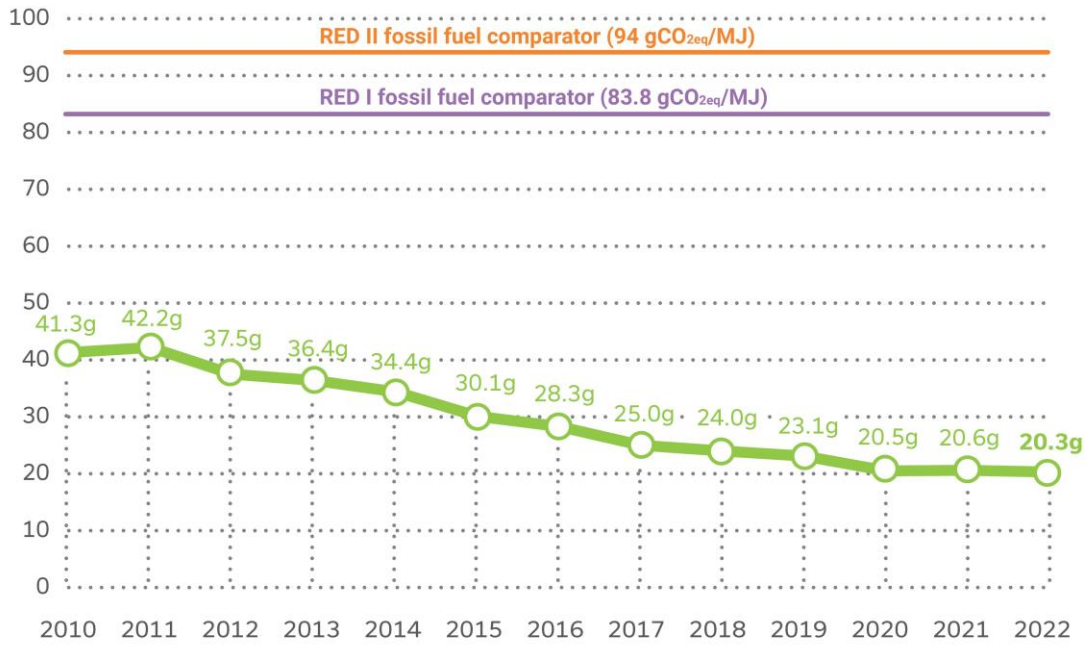
European renewable ethanol: GHG emission savings

Average certified emissions savings in %



Average certified emissions from the production and use of fuel ethanol in gCO_{2eq}/MJ



Source: Aggregated and audited data of ePURE members for 2022 for volumes certified under RED I or RED II methodology

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Relevant EU legislation and its implications

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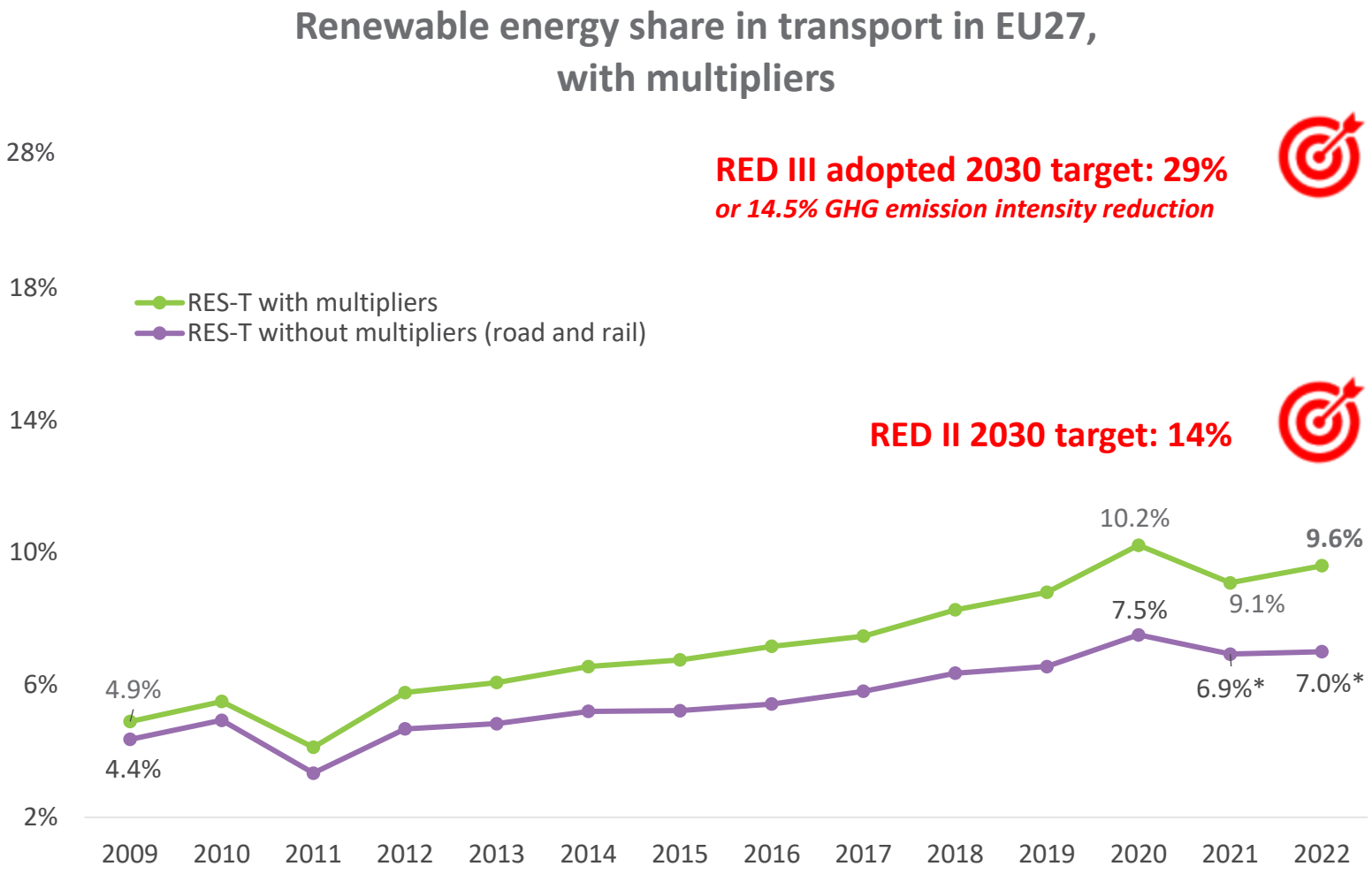
Changes to the Renewable Energy Directive (RED)

	RED II	RED II revision (aka RED III)
Overall RES in 2030	Min 32% - binding at EU level	Min 42.5% binding + voluntary 2.5% top-up to reach 45%
RES-T in 2030	**Min 14%**	**Min 29% binding OR (below)**
Reduction of GHGi in transport	/	Min 14.5% from the use of renewables [alternative to RES-T]
Crop based biofuels	2020 share + 1%, capped to 7%	2020 share + 1%, capped to 7%
Multipliers	Voluntary x2 for Annex IX, x1.5 for RE in rail; Binding x4 for Evs and 1.2x for aviation and maritime	Binding x2 for IX-A & RFNBOs, x1.2 for aviation and maritime, x4 for EVs; Voluntary 1.5x for RE in rail
Annex IX - A	Binding min 0.2% (2022), min 1% (2025), min 3.5% (2030)	IX-A + RFNBOs: min 1% in 2025 and min 5.5% in 2030
Annex IX - B	Capped to 1.7% - MS may modify the cap with EC approval	Capped to 1.7% (except CY and MT) – EC may modify the cap via delegated act
RNFBOs	/	Min 1% in 2030
FQD changes	/	B10 allowed with protection grade for B7 until 2030; FQD LCA GHG methodology repealed

Renewable energy in transport in 2021 (RES-T) in EU27
Achievement and multipliers impact



2022: **9.6% renewables in transport in the EU with multipliers; 7.0% without multipliers*** for road and rail

- Still lower than 2020 (10.2%)
- Since RED I approval in 2009, increased by a mere 4.7%
- Consumption of fossil fuels and renewable electricity is increasing
- Biofuels quantities decreased from 2021

2021: **9.1% RES-T with multipliers; 6.9%** (road and rail) **without multipliers***

RES-T must be tripled by 2030 to match Fit for 55 plans

*Source: EC SHARES, 2024; *RES-T for road and rail, based on ePURE's estimates*

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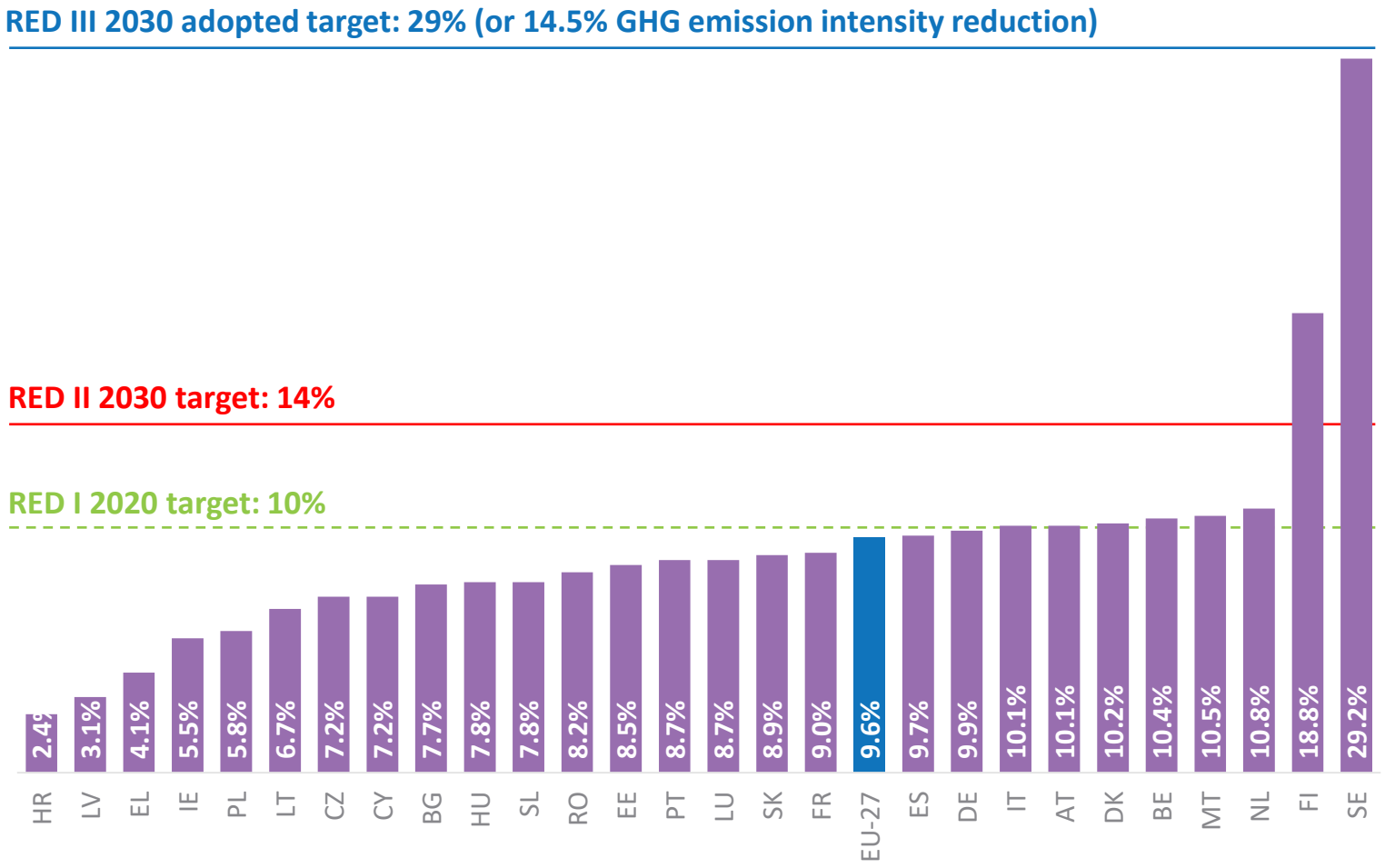
Renewables in transport (RES-T) in 2022 Per Member States with multipliers



- **With multipliers, only 8 MS are above the 2020 RES-T target,** vs. 7 MS in 2021
- **6 MS were under 7%:** EL, HU, IE, LV, LT, PL
- Apart from FI, HR and DK, **every EU MS saw their RES-T decrease between 2020 and 2021**, with the implementation of the REDII methodology

Source: EC SHARES, 2024

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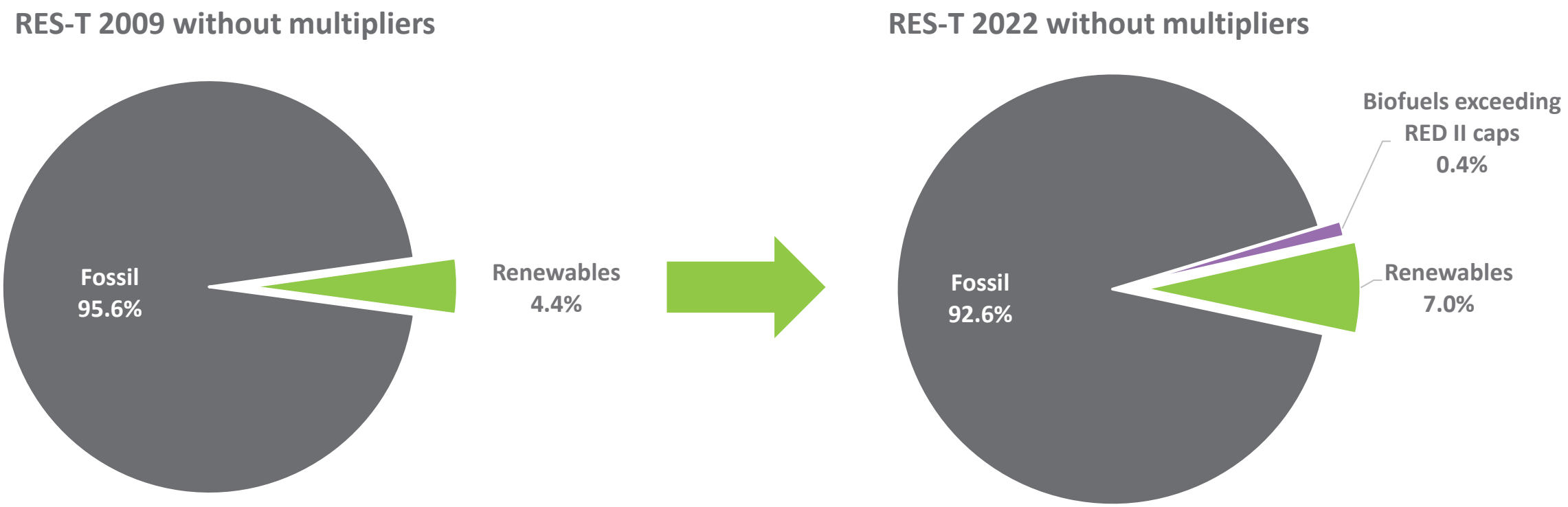
Fossil fuels dependence in 2022 – EU27



- Fossil fuels make up 92.6% of the EU transport energy consumption in road and rail
- Change since 2009 has been limited compared to ambitions
- As per the RED II, MS are not allowed to count crop-based biofuels or Annex IX-B biofuels exceeding certain caps towards the objectives of the RED II

Source: EC SHARES, 2024; ePURE estimates

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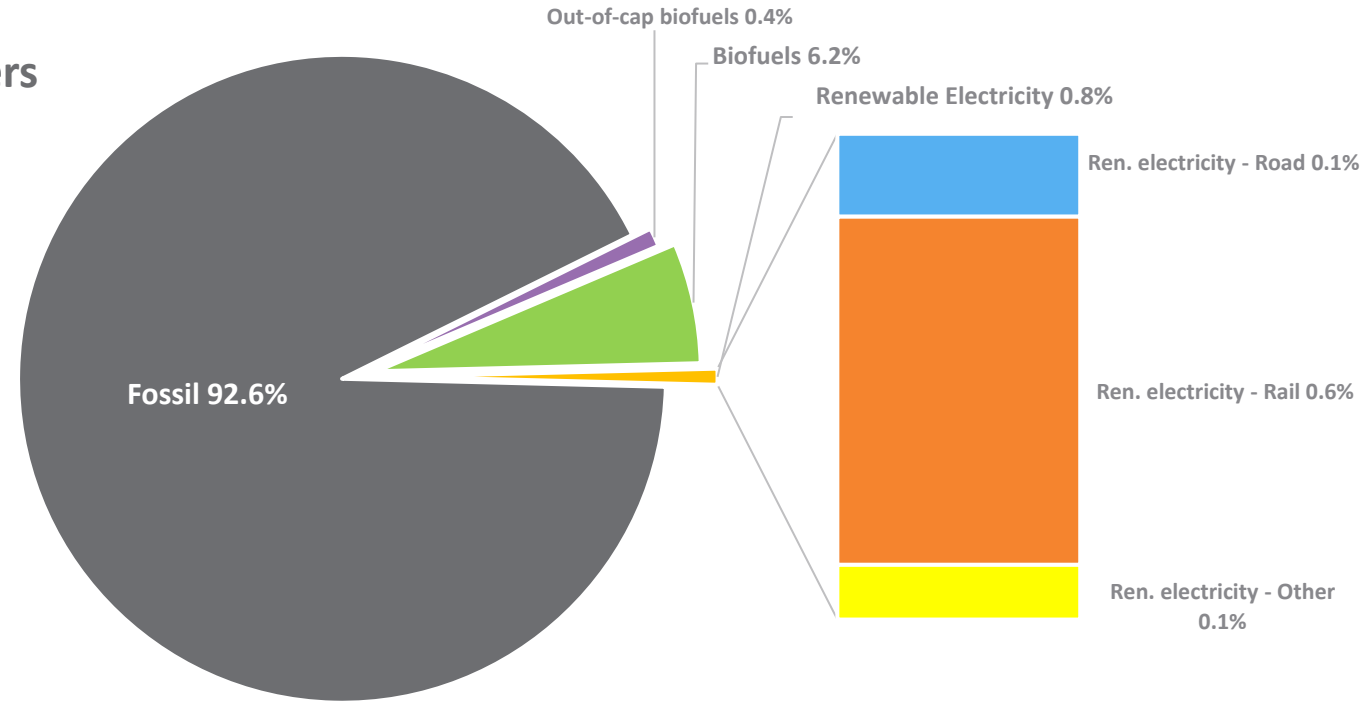
Renewables in transport (road and rail) in 2022
Contribution of biofuels and renewable electricity – EU27

RES-T 2022 without multipliers



- Fossil energy sources still account for 92.6% of energy used in road and rail transport
- The rest is made up of 7.0% renewables and 0.4% biofuels exceeding RED II caps (crop-based and Annex IX-B)
- Biofuels within RED II caps account for 6.2% of energy in road and rail
- **Renewable electricity on road merely accounts for 0.1% of all the energy in road and rail transport in EU27**
- **All available pathways must be mobilised to fulfil the EU's transport decarbonisation ambitions**

Sources: EC SHARES, 2024; ePURE estimates

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Status of E10 in the EU

Challenges and opportunities

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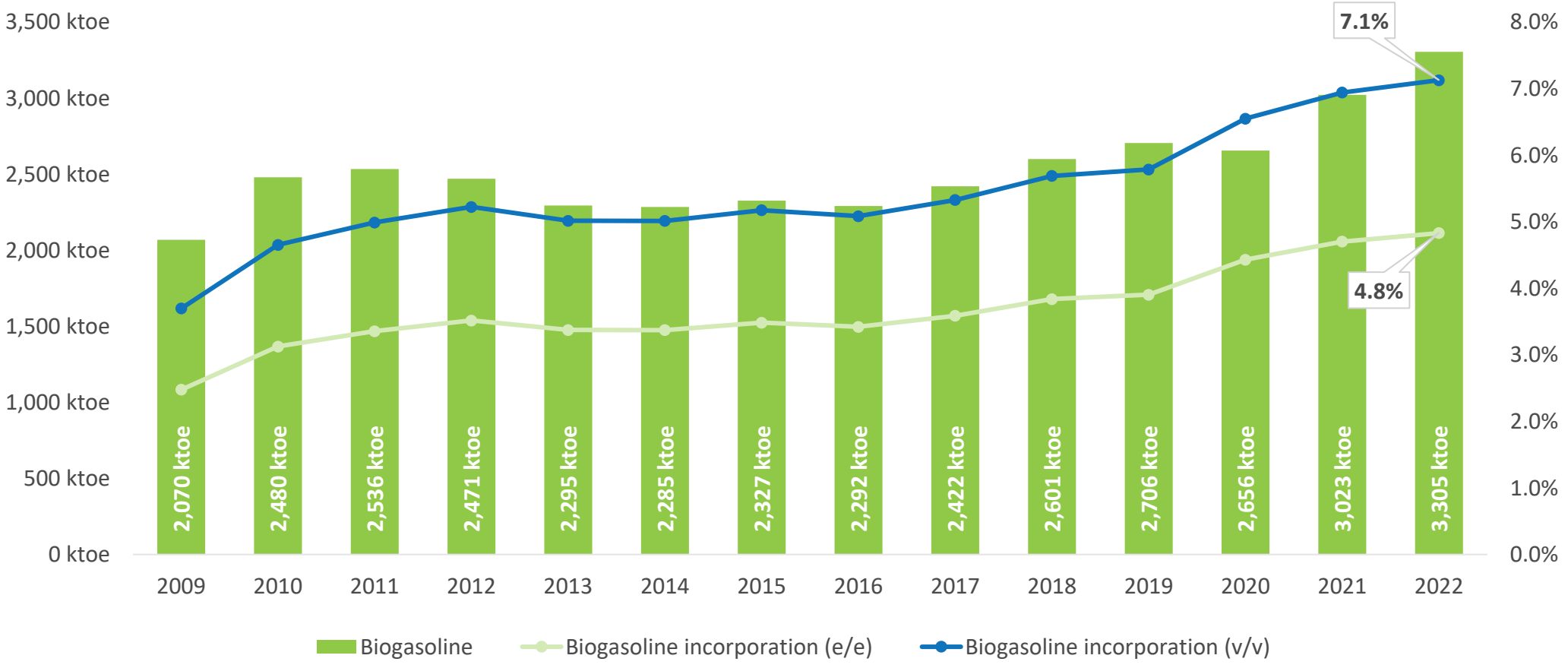
EU27 biogasoline incorporation in petrol



Source: ePURE calculations based on 2024 Eurostat data. Biogasoline (as defined by Eurostat): liquid fuels derived from biomass and used in spark-ignition internal combustion engines such as ethanol, methanol and the share of MTBE and ETBE from biomass.

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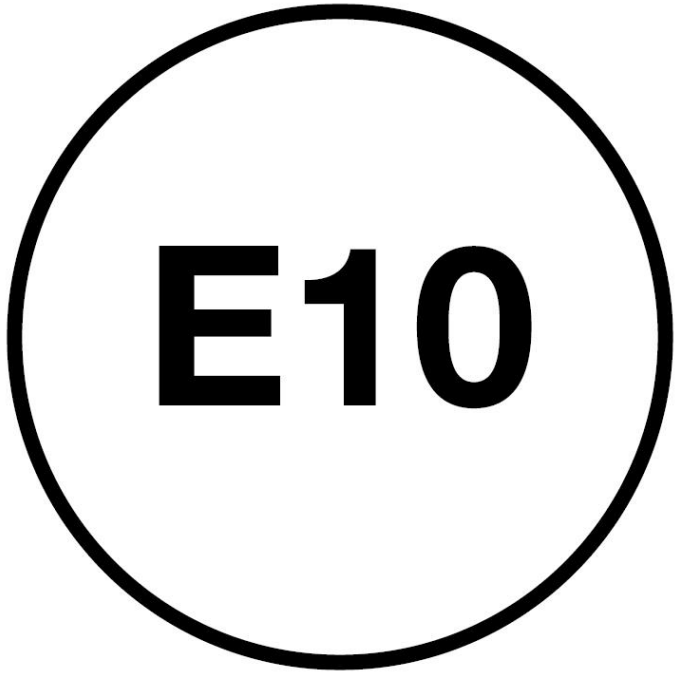
E10 – Key Features

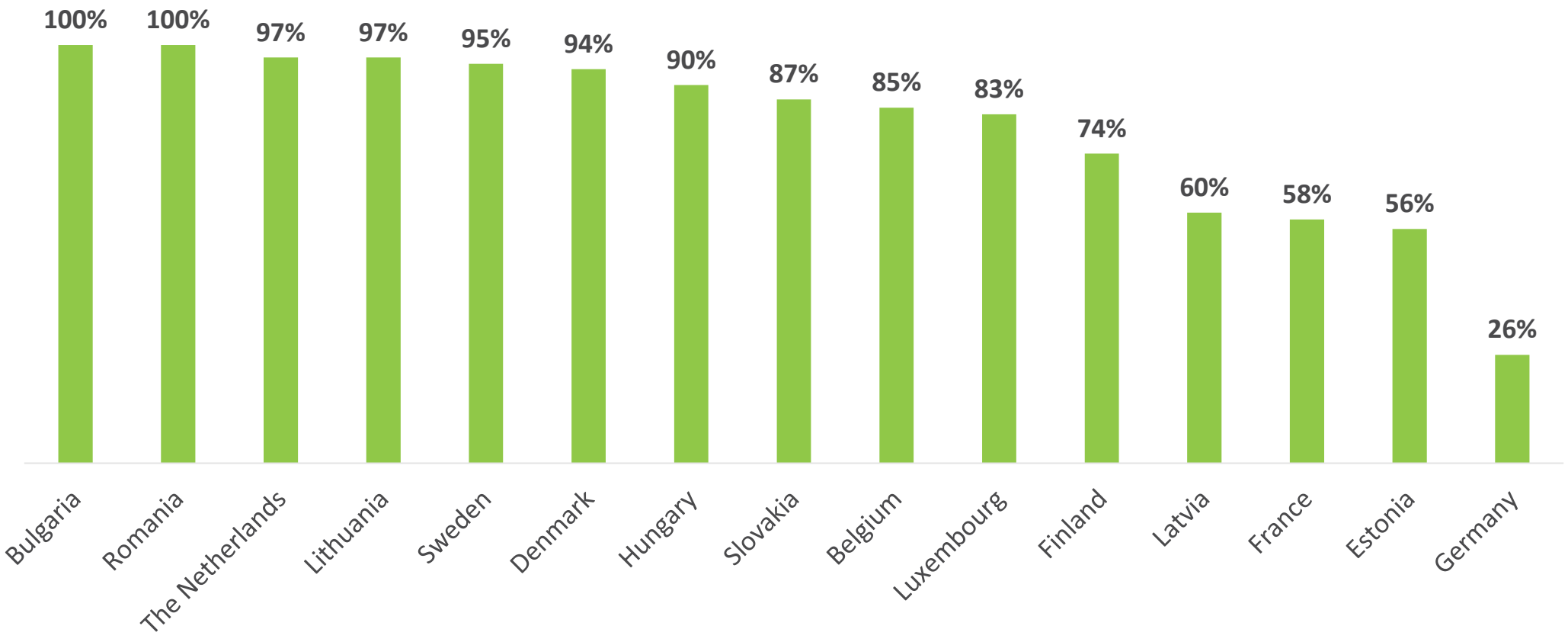
- Most requirements are identical to E5 (as per EN 228)
- Key differences compared to E5:
  - Max oxygen increased from 2.7% m/m to 3.7% m/m
  - Max ethanol increased from 5.0% v/v to 10% v/v
- No minimum ethanol content
  - Not in the standard
  - Certain EU MS mandate it through national legislation
- Most post-2000 gasoline vehicles are E10-compatible. Over 95% of the gasoline vehicle fleet is projected to be E10-compatible.



E10 Availability in Europe

- E10 introduced in 19 European countries
- First country to introduce E10: France in 2009
- Latest countries to introduce E10:
  - 2024: Poland and Czech Republic
  - 2023: Austria and Ireland
- E10 has established itself as the default grade for RON 95 gasoline in most of the countries where it has been introduced
- E5 is still available in premium gasoline grades (RON 98 and higher)
- Lower market shares for E10 in certain countries due to:
  - Logistics: Industrial and distribution peculiarities
  - Policy: E5 protection grades

E10 Market Shares in selected EU Member States



Sources: EEA monitoring data of FQD implementation; national statistics

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Gasoline sales in EU27 MS - 2021

	Gasoline (million litres, 2021)	% of EU27
Austria	1,923	2.20
Belgium	2,649	3.03
Bulgaria	638	0.73
Croatia	628	0.72
Cyprus	413	0.47
Czech	2,020	2.31
Denmark	1,728	1.98
Estonia	282	0.32
Finland	1,753	2.01
France	11,869	13.58
Germany	22,019	25.20
Greece	2,715	3.11
Hungary	1,974	2.26
Ireland	1,136	1.30
Itely	9,277	10.62
Latvia	213	0.24
Lithuania	354	0.41
Luxembou	436	0.50
Malta	102	0.12
Netherlanc	5,305	6.07
Poland	6,494	7.43
Portugal	1,092	1.25
Romania	1,488	1.70
Slovakia	722	0.83
Slovenia	476	0.54
Spain	6,972	7.98
Sweden	2,706	3.10
TOTAL E27	87,385	

Source: FQD Art 8 Monitoring Report, 2023

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Protection grades: present and past

Current legal protection grades

- Germany: E5 protection grade on RON 95
- Sweden: partial protection grade (not applying to each retail site)
- Finland: partial protection grade (not applying to each retail site) – expiring 31 Dec 2024

Historical protection grades

- Several countries used to have E5 protection grades, which eventually expired or were repealed
- France's previous E5 protection grade expired in 2018. Its influence is still visible in the retail market
  - E5 remains available for both RON 95 and RON 98 gasoline

Issues preventing E10 introduction

- Several EU MS are yet to introduce E10. This may be due to various reasons:
  - Regulatory bottlenecks or little political will
  - Reduced industry interest leading to distribution bottlenecks
  - Lack of fiscal incentives to biofuels uptake
  - Absent or limited local bioethanol production capacity

Italy

- No significant policy and regulatory bottleneck
- National biogasoline blending obligation: 1% in 2024, 3% in 2025
- Logistics is mostly controlled by a small number of operators
- Limited domestic bioethanol production

Spain

- No specific biofuel blending obligation for gasoline
- Same taxation as fossil fuels
- Logistics centralised through a single operator

Recommendations for the future

E10 and beyond

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E10 adoption and mainstreaming – Recommendations

- Ambitious RES-T target: 29% by 2030 (or equivalent GHG intensity reduction)
- Biofuel blending obligations in many countries
- Specific biogasoline blending obligations may be an effective tool
- Countries with biogasoline blending obligations > 5% (either volume or energy):
  - France, Latvia, Bulgaria, Slovakia, Romania, Lithuania, Hungary, Belgium
- Examples of specific ethanol blending obligations:
  - Latvia (9.5% vol in E10), Hungary (6.1% energy), Ireland (5.5% vol), Poland (4.59% energy)
- Fiscal incentives also help increasing biofuels uptake

Recommendations for adoption of E10 where not yet available

- Inform consumers ahead of E10 implementation
- Coordination between government and all involved industry stakeholders
- Avoid unnecessary competition between gasoline grades
- Switch to E10 should involve all supply of a given grade (e.g. RON 95) over a short timeframe to maximise efficiency and minimise infrastructure adjustments and related costs

Future Development of Biogasoline/Bioethanol Grades in the EU

E20 standardisation efforts

- E20 or higher biogasoline grades already available in many countries outside Europe
- E20 testing ongoing in Germany
- CEN E10+ Task Force developing a technical specification for future adoption
  - Biogasoline blend with max 20% v/v ethanol and between 3.7 and 8% oxygen
  - We support a minimum 10% v/v ethanol content to maximise benefits in terms of engine efficiency and GHGi reduction
- FQD revision is needed to allow higher oxygen and ethanol content in gasoline

E85 development

- E85 is also available in a number of EU MS, also including France
- CEN standardisation efforts: review of EN 15293 to allow 100% renewable E85
  - At present, E85 is a blend of ethanol (up to 85% v/v) and EN228 gasoline
  - We support direct blending of biofuels, as long as the final blend is compliant with E85 specs

Conclusion

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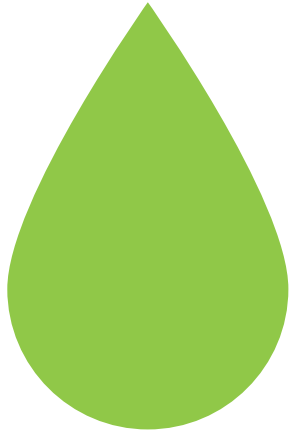
Key takeaways

- The EU is struggling to meet its ambitious decarbonisation targets in transport. RES-T implementation was 9.6% in 2022. The 2030 target is at least 29%.
- Unclear this can be achieved without implementing all available technologies compliant with RED sustainability criteria
- Constant growth in renewable ethanol emissions savings in Europe: 78% average in 2022
- Bioethanol is a key driver in defossilising and decarbonising gasoline blends
  - Renewable ethanol producers aiming for carbon neutrality in the foreseeable future
  - Potential for renewable ethanol as a CO2-neutral fuel after 2035
- Nearly the entirety of the EU gasoline vehicle fleet is E10-compatible
- 19 European countries have introduced E10, including 4 in 2023 and 2024
- Certain countries might have lower E10 market shares due to domestic market peculiarities or regulatory obligations (protection grades)
- Lower taxes on biofuels, high biofuels blending obligations and specific biogasoline blending mandates may be an effective driver for higher uptake of E10 or higher biogasoline blends
- Efforts are ongoing to standardise E20 for future implementation (pending FQD revision) and to allow marketing 100% renewable E85



THANK YOU!

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